

SUPPORT FOR THE AMENDMENTS

Claim 25 has been amended to make a formal change. Accordingly, no new matter is believed to have been added to this application by the amendment submitted above.

REMARKS

Claim 25 is pending. Favorable reconsideration is respectfully requested.

The present invention relates to a coated substrate which is a glass, ceramic or vitroceraamic substrate provided on at least a portion of one of its faces with a coating having photocatalytic properties, and comprising titanium oxide at least partly crystallized in the anatase form, and obtained by thermal decomposition of titanium precursors selected from the group consisting of organo-metallic precursors and metallic halide precursors, where the coating has a thickness between 5 and 50 nm, where the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm.

The rejection under 35 U.S.C. §102(e) or §103(a) over Vandiest (U.S. patent No. 5,721,054) is respectfully traversed. Vandiest fails to disclose or suggest the claimed coated substrate.

Appellants submitted a second executed Rule 132 Declaration from Dr. Bernard Nghiêem on May 22, 2006. Dr. Nghiêem has read and is familiar with the specification and the subject matter of claims 25-30, 34-39 and 44-45 of the present application (see paragraphs 4-6 of the second Declaration).

Dr. Nghiêem has carefully reviewed the description of the coating in the specification (see paragraph 7 of the second Declaration). Based on that review, Dr. Nghiêem concludes that:

In view of the description provided by the specification of the above-identified application, one skilled in the art would have concluded that the coating of the invention described therein and specified in the claims identified above was mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing. [See paragraph 8 of the second Declaration; emphasis added]

Dr. Nghiêm acknowledges that the specification does not contain explicitly state that the coating is mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing. However, he states:

...for the reasons discussed above, one skilled in the art reading that specification would appreciate that the coating of the substrates specified in claims 25-30, 34-39 and 44-45 of the above-identified application necessarily had those properties in order to be used as a glazing in the specification. [See paragraph 9 of the second Declaration.]

Appellants submitted the first executed Rule 132 Declaration from Dr. Nghiêm on November 23, 2005. In that Declaration, Dr. Nghiêm discusses that procedure for depositing titanium oxide coatings. See the top of page 2 of the first Declaration. Dr. Nghiêm states:

After closely examining the deposition procedure described by Vandiest, I believe that, while the conditions given by Vandiest can work well with a mixture of tin tetrachloride and water, this is not the case for titanium tetrachloride and water. On the basis of experiments I performed, I can confirm that for the deposition of titania, the use of the TiCl_4 and water ends up creating a nanoparticle powder and does not form a homogeneous coating on the substrate surface. [See page 2 of the first Declaration.]

Dr. Nghiêm points out that attempting to deposit titanium dioxide under the conditions described by Vandiest produces the well-known result of creating powder as had been used in fluid flows to study the hydrodynamics of the flow (see the bottom of page 2 and the top of page 3 of the first Declaration).

Beginning at the bottom of page 3 of the first Declaration, Dr. Nghiêm describes the deposition procedures as described in patents referred to by Vandiest in the specification of the patent. Dr. Nghiêm states

If such a configuration (in figure 3) is used with water and titanium tetrachloride, at the intersection region between the 2 flows from the 2 nozzles, nano powder is formed instead of a coating. [Declaration page 3, last sentence.]

So if this kind of tool is used with TiCl_4 and water instead of SiH_4 and O_2 , nano power is formed before arriving on the substrate surface. [Declaration page 4, last sentence.]

Beginning at page 6 of the first Declaration, Dr. Nghiêm describes experiments that were conducted in order to reproduce the conditions of the deposition and the tool for the gas injection mentioned by Vandiest and FR2648453. Dr. Nghiêm summarizes the results of the experiments at the top of page 9, stating:

With the preceding deposition parameters, we could not deposit any real coating. Instead, we have produced powder, part of which weakly adheres to the surface of the substrate when the experiment was over. This powder can be easily wiped out by a tissue cloth.

Dr. Nghiêm concludes as follows:

The process parameters described by Vandiest for the deposition of large gap semi conductor like SnO_2 or TiO_2 , starting from Ti or Sn tetrachloride with water as oxidant are only valid for the deposition of SnO_2 . In the case of TiO_2 , our own experiments and several scientific sources have proven clearly that even at low temperature TiO_2 powder is formed when TiCl_4 and water is brought into contact, instead of an homogeneous coating on the surface. [Declaration at the middle of page 9.]

Thus, the Declaration of Dr. Nghiêm demonstrates that the method described in Example 1 of Vandiest does not produce a photocatalytic coating of titanium dioxide on a substrate.

In fact, in Dr. Nghiêm's second Declaration he states:

For those reasons, the process parameters described by Vandiest do not provide a coating of photocatalytic titanium oxide that is mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing as specified in claims 25-30, 34-39 and 44-45 of the above-identified application. [See paragraph 11 of the second declaration.]

Appellants submitted an executed Rule 132 Declaration from Dr. Léthicia Guéneau on December 8, 2003. Dr. Guéneau has eight years of experience in the field of physico chemistry/self-cleaning glass (see paragraphs (1) and (2) of the Declaration).

Dr. Guéneau points out that in Example 2, Vandiest describes a glass substrate coated with a 41 nm TiO₂ layer, which, in turn, is coated with a layer of Fe, Co, and Cr oxides having a thickness of 45 nm (see paragraph (6) of the Declaration). In Example 3, Vandiest describes a glass substrate coated with a 85 nm TiO₂ layer, which, in turn, is coated with a layer of Fe, Co, and Cr oxides having a thickness of 46.5 nm (see paragraph (7) of the Declaration). According to Dr. Guéneau, Fe, Co, and Cr oxides are well-known to be poisons for photocatalysts. Therefore, one of ordinary skill in the art would limit the contents of those metal oxides because of their known properties as photocatalyst poisons (see paragraph (8) of the Declaration).

The Examiner asserts that the analysis provided by Dr. Guéneau is contradicted by the specification of the present application and Kato (see the Examiner's Answer dated April 27, 2004 at page 10, first full paragraph). This is not the case. That this is so is demonstrated by Carneiro et al., Study of the Deposition Parameters and Fe-Dopant Effect in the Photocatalytic Activity of TiO₂ Films Prepared by dc Reactive Magnetron Sputtering, *Vacuum*, 78, 2005, pp. 37-46, a copy of which was cited on May 22, 2006. Carneiro et al. describe the effect of doping a photocatalytic coating of TiO₂ on a substrate with iron. At a low concentration of iron, the layer has higher photocatalytic activity as compared to the undoped layer. In contrast, a highly-doped layer has strongly decreased photocatalytic activity. In view of the foregoing, Dr. Guéneau's comments are not inconsistent with the specification of the present application and Kato.

In addition, in Examples 2 and 3, the TiO₂ layer is buried under the Fe-Co-Cr layer. For that reason, one would expect that accumulated organic matter could not be decomposed by the TiO₂ layer because it would never get to that layer. Therefore, such a layer is not photocatalytic as recited in the claims of the present application.

Referring to the Examiner's comments at the first full paragraph at page 13 of the Office Action dated November 14, 2006, the Declarations discussed above address both embodiments described in Vandiest. The two Declarations submitted by Dr. Nghiêm address the embodiment where the TiO₂ layer is on the surface, i.e., the non-absorbent layer is on the absorbent layer. The Declaration from Dr. Guéneau addresses the embodiment in which the TiO₂ layer is on the bottom, i.e., the absorbent layer is on the non-absorbent layer.

In view of the foregoing, Vandiest fails to describe or suggest the claimed coated substrate. Accordingly, withdrawal of these grounds of rejection is respectfully requested.

The rejection under 35 U.S.C. §103(a) over Plumat et al. (U.S. patent No. 3,984,591) in view of Vandiest or Kato is respectfully traversed. The cited references fail to suggest the claimed coated substrate.

Plumat et al. describe a process for forming a metallic oxide coating on a substrate. See the Abstract. As recognized by the Examiner, Plumat et al. fail to disclose a coating of titanium oxide in the anatase form that is photocatalytic. See, for example, page 9 of the Office Action dated February 21, 2006.

Dr. Guéneau notes that Kato is completely silent regarding the size of titanium oxide crystallites (see paragraph (15) of the Declaration). According to Dr. Guéneau, Kato also fails to suggest that the titanium crystallites have an average size of between 60 and 100 nm, since the reference fails to even mention titanium crystallites at all. See paragraph (18) of the Declaration.

As discussed above, Vandiest fails to suggest the claimed coated substrate. Accordingly, the combination of Plumet et al. with either Vandiest or Kato fails to suggest the claimed substrate. Withdrawal of this ground of rejection is respectfully requested.

The rejection of the claims under 35 U.S.C. §112, first paragraph, is respectfully traversed.

The Office has provided no explanation or basis for the rejection. For this reason alone, the rejection should be withdrawn.

Moreover, in view of the description in the specification that the average size of the crystallites may be 0.5 to 100 nm (see page 3, lines 18-22), one would appreciate that the techniques described in the specification for making the coating could be used to produce crystallites having an average size of 60 to 100 nm as claimed using routine experimentation.

Accordingly, the claims are enabled, and the rejection should be withdrawn.

The rejection of the claims under 5 U.S.C. §112, second paragraph, is believed to be obviated by the amendment submitted above. Accordingly, withdrawal of that ground of rejection is respectfully requested.

Application No. 09/923,353
Reply to Office Action of October 11, 2007

Applicants submit that the present application is in condition for allowance. Early notice to this effect is earnestly solicited.

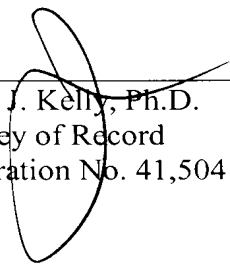
Respectfully submitted,

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